

**SPECIES OF *APHIS* (HEMIPTERA: APHIDIDAE: APHIDINA) LIVING ON
SCHINUS (SAPINDALES: ANACARDIACEAE) WITH DESCRIPTION OF
A NEW SPECIES**

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Abstract.—Aphids collected on species of *Schinus* (Anacardiaceae) in Argentina and Chile, mainly in Andean localities, are studied. The variability of *Aphis schinifoliae* Blanchard, 1939, is discussed and males are described. Apterous and alatae viviparous females, oviparous females, and males of a **new species**, *Aphis schinivora*, are described. A key to Aphidini species that could be found on Anacardiaceae in South America is given.

Resumen.—Se han estudiado los pulgones recogidos en localidades de Argentina y Chile, principalmente andinas, sobre especies de *Schinus* (Anacardiaceae). Se expone la variabilidad de *Aphis schinifoliae* Blanchard, 1939 y se describen los machos. Se describen las hembras vivíparas ápteras y aladas, las hembras ovíparas y los machos de una **nueva especie**, *Aphis schinivora*. Se presenta una clave para las especies de Aphidini que pudieran encontrarse en Sudamérica sobre especies de Anacardiaceae.

Key Words: *Aphis schinivora*, Aphididae, Aphidina, aphids, new species, Chile, Argentina, South America, Andes, Anacardiaceae

Argentinean entomologist Everard E. Blanchard (1899–1971) described 39 species and subspecies of aphids, 18 of which (15 species and 3 subspecies) are considered available today (Cortés 1973, Nieto Nafría et al. 1994, Seco Fernández et al. 2000, Ortego et al. 2004, Nieto Nafría et al. in press). One species is *Aphis schinifoliae* Blanchard, 1939, which lives on various species belonging to the genus *Schinus* L., 1753 (Anacardiaceae).

Blanchard (1939) described only the apterous viviparous females collected on *Schinus dependens* Ortega, 1798, in Los Cocos (Córdoba province). However, if we take into account the species of

Schinus present in Argentina and their distribution (Zuloaga and Morrone 1999), the plant may, in fact, be *Schinus fasciculatus* (Griseb) I.M. Johnst., 1938. Remaudière et al. (1991) described the winged viviparous females and the oviparous females, and provided more data on the apterae based on material collected on *Schinus dependens* (we have similar doubts with regard to the identification of the plant) and *Schinus molle* L., 1753, by Bahamondes in Mendoza (Argentina). Hinojosa de Fernández (1964); Blackman and Eastop (1994), and Nieto Nafría et al. (1994) have reported the species in Bolivia, Chile, and Tucumán

Province (Argentina), respectively. It is not present in Brazil, despite the fact that Bertels (1973) recorded it in the State of Rio Grande do Sul (Costa et al. 1993; Sousa-Silva and Ilharco 1995; Pérez Hidalgo et al. 1998, and Nieto Nafría and Mier Durante 2006).

The genus *Schinus* (Rosidae, Sapindales: Anacardiaceae), with about 30 species, is distributed from southern United States to the southern part of the continent (Argentina and Chile).

According to Blackman and Eastop (1994), three aphid species have been recorded on species of *Schinus*: *Aphis schinifoliae* (on *S. dependens* and *S. molle*), *Aphis gossypii* Glover, 1877 (on *S. molle* and *S. terebinthifolius* Raddi, 1820), and *Toxoptera aurantii* (Boyer de Fonscolombe, 1841 (on *S. terebinthifolius*). These authors also record aphid species (mostly Fordini, Eriosomatinae) throughout the world on plants belonging to another 12 genera of Anacardiaceae, and amongst them, there are another six species of the tribe Aphidini: *A. spiraecola* Patch, 1914, *A. craccivora* Koch, 1854, *A. fabae* Scopoli, 1763, *A. rhoicola* Hille Ris Lambers, 1954, and another two species in the same tribe Aphidini: *Brachyunguis harmalae* Das, 1918, and *Toxoptera odinae* (van der Goot, 1917). Only the first three of these six species were recorded in South America, and all three are polyphagous.

In recent years, we have carried out expeditions to collect aphids mainly in the Andean area of Argentina to increase our knowledge of the South American aphid fauna. We have studied 11 Argentinian samples and 2 Chilean samples, all collected on *Schinus*.

MATERIAL AND METHODS

Techniques for collecting, preserving, slide mounting and measuring, aphids, as well as terminology, are reported in our previous papers (Mier Durante et al. 2006).

Abbreviations used in the text and figure captions are as follows: AbdI, AbdII, AbdIII, AbdIV, AbdV, AbdVI, AbdVII, AbdVIII = abdominal segments I to VIII; AntI, AntII, AntIII, AntIV, AntV, AntVIb, AntVIpt = antennal segments I to V plus base and processus terminalis of antennal segment VI, respectively; Ars = apical rostral segment; D = basal diameter of antennal segment III; and Ht2 = second segment of hind tarsus. Values in parentheses are exceptional values.

Table 1 shows the collection data for the specimens studied.

RESULTS AND DISCUSSION

Using a stereoscopic microscope, viviparous apterous females in alcohol (Table 1) were separated into two groups: 1) specimens collected on various species of *Schinus*, with pale siphunculi at least as long as the cauda, or exceptionally slightly shorter, identified as *A. schinifoliae*; and 2) specimens collected on *Schinus johnstonii* F.A. Barkley, 1944, with very dark, and very short siphunculi (shorter than 2/3 cauda length), considered a new species.

Aphis schinifoliae Blanchard 1939 (Figs. 3B, 4A)

The apterous viviparous females caught in Paso Pehuenche: Las Garzas and in Malargüe: Refugio del Club Andino, differ from the other *A. schinifoliae* specimens (Fig. 4A) in that they have much more voluminous abdominal papillae and slightly longer dorsal abdominal setae. The data obtained in the morphometric study of these females (Table 2) show that there is only one species, *Aphis schinifoliae*, which is more variable than first thought.

Three of the studied samples (Table 1) have sexuals. The oviparous females are similar to those described by Remaudière et al. (1991) and the males, which are

Table 1. Studied material (ap., al., ov., m.: respectively apterous viviparous, alatae viviparous and oviparous females, and males) of *Aphis (A.) schiniifoliae* [A.sf.] and *Aphis (A.) schiniivora* [A.sv.]; respective samples in alphabetical order for "host plant" and "locality name."

Host plant	Locality				Altitude (m)	Andean	Date	Leg.	Coll. number	Material	Species
	Name	Southern Latitude	Western Longitude								
<i>Schinus gracilipes</i>	Tafi del Valle (Tucumán, Argentina)	26° 52'	65° 41'	2015	X	15/09/1985	M.A. Delfino	ARG-6	ap.		A.sf.
<i>Schinus molle</i>	Esperanza (Santa Fe, Argentina)	31° 28'	60° 55'	38		20/09/1995	J.M. Nieto	ARG-49	ap.		A.sf.
<i>Schinus molle</i>	Mendoza (Mendoza, Argentina)	32° 54'	68° 49'	824	X	8/02/2000	authors	ARG-558	ap.		A.sf.
<i>Schinus molle</i>	San Rafael (Mendoza, Argentina)	34° 37'	68° 19'	650		16/10/1995	J. Ortego	ARG-1078	ap.,al.		A.sf.
<i>Schinus roigii</i>	Parque Tromen (Neuquén, Argentina)	37° 5'	70° 8'	1785	X	27/01/2000	authors	ARG-507	ap.		A.sf.
<i>Schinus</i> sp. (? <i>roigii</i>)	Malargüe: Refugio del Club Andino (Mendoza, Argentina)	35° 24'	69° 54'	2183	X	12/03/1994	J. Ortego	ARG-1077	ap.,m.		A.sf.
<i>Schinus</i> sp. (? <i>roigii</i>)	Malargüe: Refugio del Club Andino (Mendoza, Argentina)	35° 24'	69° 54'	2183	X	7/12/1996	J. Ortego	ARG-1079	ov.,m.		A.sf.
<i>Schinus</i> sp. (? <i>roigii</i>)	Malargüe: Refugio del Club Andino (Mendoza, Argentina)	35° 24'	69° 54'	2183	X	4/02/2000	authors	ARG-533	ap.		A.sf.
<i>Schinus</i> sp.	General Roca (Río Negro, Argentina)	39° 02'	67° 35'	300		8/02/2003	J. Ortego	ARG-938	ap.		A.sf.
<i>Schinus</i> sp.	Paso Pehuénche: Las Garzas (Maule, Chile)	~35° 57'	~70° 20'	1160	X	2/02/2000	authors	CHI-122	ap.,ov		A.sf.
<i>Schinus johnstonii</i>	Lago Tromen (Neuquén, Argentina)	39° 32'	71° 27'	~1000	X	23/01/2000	authors	ARG-457	ap.,al.,ov.,m.		A.sv.
<i>Schinus johnstonii</i>	Paso Pehuénche: La Mina (Maule, Chile)	35° 55'	70° 37'	1542	X	31/01/2000	authors	CHI-95	ap.		A.sv.
<i>Schinus johnstonii</i>	San Martín de los Andes (Neuquén, Argentina)	40° 10'	71° 23'	812	X	25/01/1999	J. Ortego	ARG-1023	ap.		A.sv.

Table 2. Metric and meristic data of apterous viviparous females and males of *Aphis schimifoliae*. The letters in bold indicate the final limits of each character.

Character	Apterous viviparous females				Males	
	Previous data		New data		New data	
	Blanchard 1939 holotype	Remaudière & al. 1991	Small papillae (n=30)	Large papillae (n=20)		
Body (mm.)	1.72	1.60-2.23	1.40-2.25	1.08-2.05	1.00-1.45	
Antenna (mm.)	0.99	0.85-1.25	0.80-1.25	0.52-1.33	0.80-1.15	
Antenna/Body (times)	0.58	0.5-0.6	0.5-0.7	0.4-0.7	0.7-0.9	
AntIII (mm.)	0.26	0.19-0.34	0.18-0.34	0.15-0.38	0.21-0.33	
AntIV (mm.)	0.14	0.13-0.22	0.10-0.22	0.07-0.24	0.13-0.21	
AntV (mm.)	0.18	0.14-0.23	0.14-0.23	0.11-0.25	0.14-0.20	
AntVIb (mm.)	0.11	0.09-0.13	0.09-0.13	0.07-0.13	0.09-0.12	
AntVIpt (mm.)	0.15	0.15-0.19	0.11-0.20	0.12-0.19	0.13-0.17	
Ars (mm.)	0.13	0.13-0.14	0.11-0.16	0.12-0.16	0.12	
Ht2 (mm.)	0.11	0.12-0.13	0.10-0.13	0.08-0.13	0.09-0.11	
Ars/Ht2 (times)	1.2	1.1-1.2	1.0-1.2	1.2-1.4	1.0-1.3	
Siphunculus (mm.)	0.19	0.18-0.27	0.15-0.31	0.11-0.30	0.12-0.16	
Siphunculus/its width at middle (times)	0.13	3.4-4.1	2.5-5.2	2.6-5.0	2.7-3.5	
Cauda (mm.)	1.5	0.14-0.18	0.11-0.19	0.10-0.20	0.07-0.11	
Siphunculus/Cauda (times)	10	1.2-1.6	1.1-1.7	1.0-1.7	1.2-1.5	
Number of setae on cauda		4-9	4-7	5-10	5-8	
Papillae on AbdII-AbdVI, total number		6-8	(2)5-9	(2)7-9	6-8	
Setae on AntIII (µm)		14-17	10-20	15-18	15-20	
Setae on AntIII/D (times)		0.5	0.5-0.9	0.7-1.2	0.9-1.2	
Setae on Vertex (µm)			15-28	23-33	20-35	
Setae on Vertex/D (times)			0.8-1.6	1.1-1.8	1.2-1.9	
Setae on Marginal AbdIII (µm)			18-30	15-45	20-37	
Setae on Marginal AbdIII/D (times)		30-33	0.9-1.5	0.9-2.0	1.4-1.9	
Setae on Spinal AbIII (µm)			18-38	25-38	27-37	
Setae on Spinal AbdIII/D (times)			0.9-1.7	1.3-2.1	1.4-2.0	
Setae on AbdVIII (µm)		48-57	33-53	40-55	35-50	
Setae on AbdVIII/D (times)			1.6-2.6	2.1-3.0	2.2-2.8	

apterous, are described below. The presence of sexuals, and in particular, the apterous males, demonstrate that the species is monoecious holocyclic on several species of *Schinus*, although it also may be anholocyclic, like other aphid species, should be considered.

Remaudière et al. (1991) were surprised at the presence of oviparous females in November. Our collections in December were just as surprising, but the February and March ones are normal, though somewhat early.

Our data indicate that the species could produce sexuals during the austral summer without interrupting the production of viviparous females, as occurs with *Macrosiphum meixneri* Börner, 1950 (Nieto Nafría and Mier Durante 1991) in the Cantabrian Mountains. Also, the sexuals collected in spring could come from viviparous females that remained on the plants during winter, either in sheltered places or under a layer of snow. Leclant (1978) recorded aphids remaining on the host plant in a place with air and under a layer of snow for *Wahlgreniella ossianilssoni* Hille Ris Lambers, 1949, on *Arctostaphylos uva-ursi* in the French Alps, and Nieto Nafría and Mier Durante (data not edited) for *Acyrtosiphon* sp. on *Euphorbia flavicoma* subsp. *occidentalis* (perhaps *A. matilei* Remaudière and Leclant 2000) in the Spanish Cantabrian Mountains.

This species, recorded for the first time in Neuquén, Río Negro, and Santa Fe provinces, is widely distributed, known from 60°55'W of Esperanza (Santa Fe, Argentina) in the east to Chile in the west, and from Bolivia in the north to 39°02'S of General Roca (Río Negro, Argentina) in the south.

Males are apterous (Fig. 3B). Slide-mounted specimens have a pigmented head, rostrum, antennae, most of the length of the legs, parameres, anal plate, and cauda, plus sometimes stigmatic and intersegmental sclerites and a band on

AbdVIII. AntIII, AntIV, and AntV have 8–16, 4–11, and 4–9 secondary sensoria, respectively. Other metric and meristic characteristic are shown in Table 2.

Aphis schinivora Ortego, Nieto Nafría,
and Mier Durante, new species

(Figs. 1, 2, 3B)

Apterous viviparous female (n = 381; 39 measured) (Fig. 1).—Body 0.94–1.38 mm long, 13.1–26.9 times siphunculus, which is very short. Shiny black with partially white legs when alive. Slide-mounted specimens with pigmented head, antenna, partially thorax, partially legs, siphunculi, cauda, and genital and anal plate; see detailed pigmentation in description of each part.

Front margin moderately sinuate or convex. Head, AntI and AntII brown to dark brown. Setae on vertex fine, acute, 15–38 μ m long and 1.2–2.4 times D. Antenna 6 segmented, but AntIII and AntIV sometimes coalescent or exceptionally 5 segmented, 0.55–0.78 mm long, 0.47–0.67 times body length and without secondary sensoria. AntIII pale to dark brown, dorsally smooth or very tenuously imbricated and ventrally imbricated, 0.12–0.23 mm long (0.9–1.9 times AntVIpt) and with 3–7 setae, which are 15–30 μ m long and 1.0–1.8 times D. Other segments of antennal flagellum brown to dark brown and wrinkly; AntIV and AntV, respectively, 0.06–0.12 and 0.07–0.12 mm long; AntVIpt 0.10–0.16 mm, 0.9–1.5(1.9) times AntIII, and 1.2–1.9 times AntVIb, which is 0.07–0.10 mm long. Rostrum brown reaching or overlapping hind coxae; Ars 0.10–0.12 mm, 1.0–1.3 times Ht2, 1.0–1.5 times AntVIb, 2.0–3.1 times its basal width, and with straight sides and 2 long secondary setae.

Coxae, trochanters, most of femur length, distal one-third of tibiae and tarsi brown to dark brown; other parts of legs not as pigmented, light brown to brown.

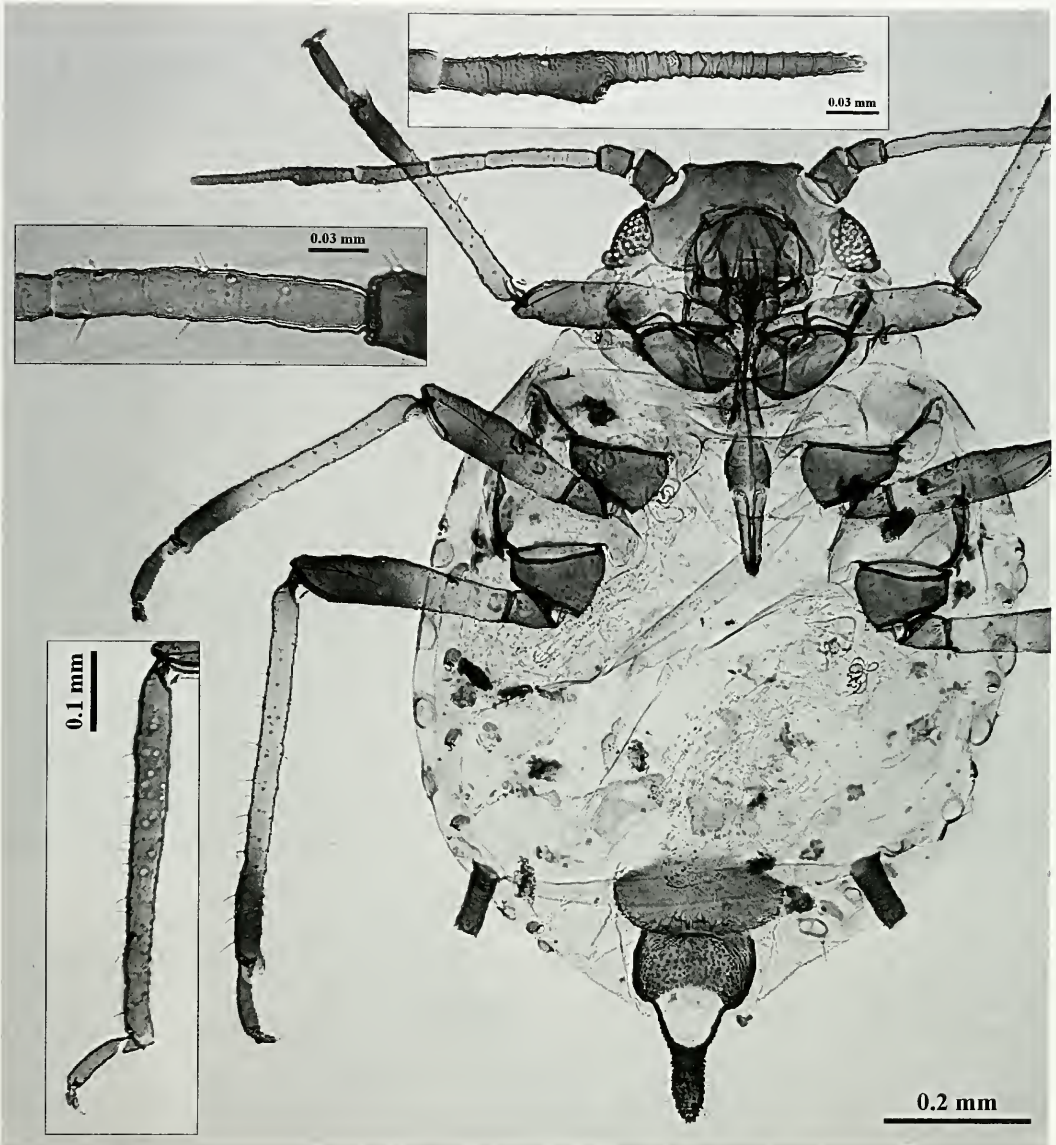


Fig. 1. *Aphis schinivora*, apterous viviparous female, general view and detailed AntIII and AntVI; oviparous female, tibia and tarsus of hind leg.

Inside seta of hind trochanter 33–43 μm , 0.6–1.3 times diameter of trochanter-femoral joint. Longest dorsal setae on hind femur 25–38 μm and 1.3–3.0 times D. Outside setae at mid length of hind tibia 20–38 μm long and 1.1–1.7 diameter of article at its insertion point. First tarsal segment with 3.3.2 setae. Ht2 0.08–0.10 mm long.

Pigmented areas on dorsum of thorax usually restricted to marginal areas and sometimes extended on metathorax, but paler than head. Dorsal abdominal pigmented sclerotized areas very variable: from stigmatic and some intersegmental sclerites and very straight bar on AbdVIII (before hairs) to stigmatic, intersegmental and marginal sclerites,

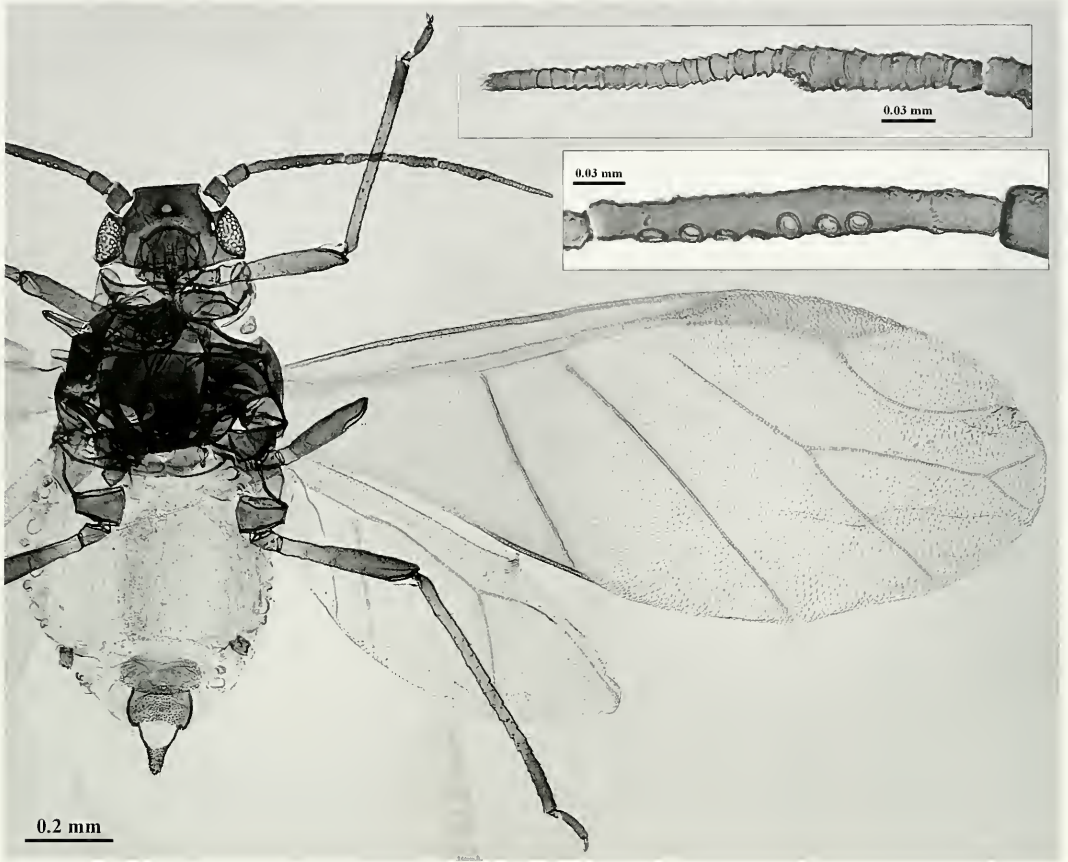


Fig. 2. *Aphis schinivora*, alatae viviparous female. AntIII and AntVI are detailed.

broken large spinal-pleural on AbdIV, spinal sclerites to small patches on AbdI–AbdIII and AbdV–AbdVI, and bars on AbdVII and AbdVIII; segmental ones tenuously reticulated and paler than coxae or siphunculi.

Marginal papillae on prothorax, AbdI, AbdVII and (5)6–9 on AbdII–AbdVI; prothoracic ones large, longer than triommatidium axis but relatively short, larger than abdominal ones; smallest on AbdVII and, if they exist, on AbdV and AbdVI and AbdVII. Marginal and spinal setae on AbdIII, respectively, 25–48 μm (1.0–2.5 times D) and 18–35 μm (0.7–1.6 times D); setae on AbdVII and AbdVIII, which are 2(4) in number, respectively, 13–25 μm (1.0–2.4 times D) and 10–33 μm (1.7–2.8 times D).

Siphunculus dark brown to black, cylindrical, and very short (0.04–0.10 mm long, 1.1–2.9 times its width at middle, and 0.3–0.7 times cauda), wrinkly and with a small apical flange. Genital plate with 2–4 discal and (4)7–12(19) posterior setae, and dark brown similar to anal plate. Cauda brown to dark brown, more pigmented on margins, 0.09–0.17 mm and (0.8)1.1–1.9 times its basal width, with 4–8 setae.

Alate viviparous female ($n = 1$) (Fig. 2).—Body 1.33 mm long, and similar to apterous females, although with less sclerotization, a straight bar both on AbdVII (broken) and AbdVIII (complete), and antenna 0.85 mm long. AntIII and AntIV with 5–8 and 0–1 secondary sensoria, respectively.

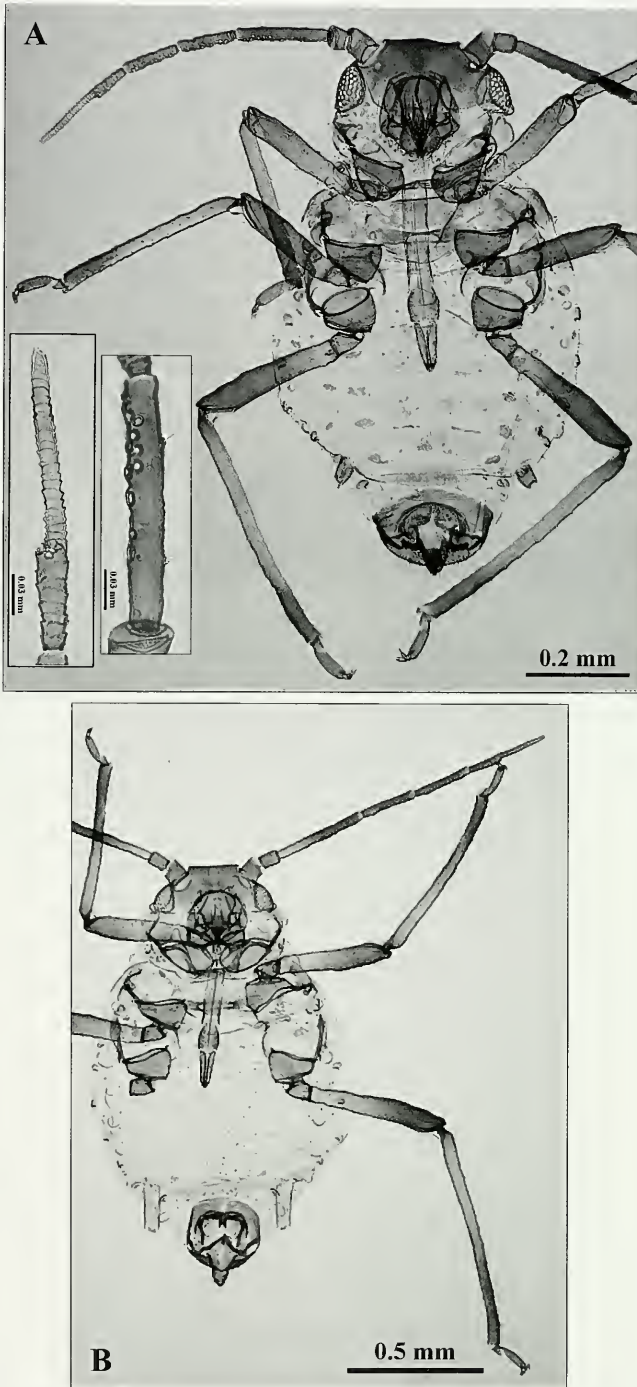


Fig. 3. Apterous males. A, *Aphis schiniivora*, AntIII and AntVI are detailed. B, *A. schinifoliae*.

Oviparous female (n = 1) (Fig. 1).—Body 1.12 mm long, similar to viviparous apterous females that have poor dorsal sclerotization and pigmentation; AntIII and AntIV joined and together 0.21 mm long, 11 setae on cauda, bi-colored genital plate with 16 discal and 24 posterior setae, and hind tibia brown, gradually enlarged and with 31 scent plates (one hind leg missing).

Male, apterous (n = 3) (Fig. 3A).—Body 0.97–1.07 mm long with antenna and legs brown to dark brown. Dorsal sclerotization and pigmentation more extended than apterous viviparous female, with spinal twin plates on AbdII–AbdVI (coalescing to make a spinal complete plate) and bars on AbdVII–AbdVIII. AntIII, AntIV, and AntV, respectively, with 10–13, 2–8, and 3–7 secondary sensoria placed on ventral part of segments. Metric and other meristic features similar those of apterous viviparous female, though antenna 0.6–0.9 times body length, which is 10.5–11.0 siphunculus, and minimal differences in length of some setae.

Type material.—Holotype: apterous viviparous female (ARG-457 measured specimen 11) collected on *Schinus johnstonii* F.A. Barkley at Lago Tromen (Neuquén, Argentina), 23-I-2000. Deposited in collection of the Universidad de León (Departamento de Biología Animal). Paratypes: 117 apterous viviparous females, 1 viviparous alatae female, 1 oviparous female, and 3 males (apterous) found with the holotype, and 263 apterous females caught on the same plant in San Martín de los Andes (Neuquén), 25-I-1999, J. Ortego leg., and in Paso Pehuenche: La Mina (Maule, Chile). Deposited in the collections of the Universidad de León (Leon, Spain), INTA EEA Junín (Junín, Mendoza, Argentina), The Natural History Museum (London, United Kingdom), Muséum Nationale d'Histoire Naturelle (Paris, France), and the National Muse-

um of Natural History, Smithsonian Institution aphid collection (Beltsville, MD, USA).

Etymology.—The specific name, *schinivora*, is an adjective in the feminine gender (as is *Aphis*) derived from the host plant generic name and “vora”, that means “eater” in Latin.

Biology and distribution.—The presence of sexual specimens on *Schinus johnstonii* shows that *Aphis schinivora* is monoecious and holocyclic. As the sexuals were collected at the end of January during midsummer and not at a high altitude (approximately 1000 m), we think that their life cycle could well be very short. This species forms very dense colonies on the stems and leaves where it produces abundant honeydew.

The only host plant species of *A. schinivora* is *Schinus johnstonii*, but it is uncertain whether it can live on other shrublike species of *Schinus*. *S. johnstonii* occurs in large areas of western Argentina, from Chubut to San Juan and San Luis provinces and in several areas in Chile (Missouri Botanical Garden 1999; Zuloaga and Morrone 1999); the aphid has been located only in part of this area, but it might live in a more extensive area. In any case, we think that its distribution area is smaller than that of *A. schinifoliae*.

Taxonomic discussion.—The new species is very distinct due to the combination of the following characters: pale and unsclerotized or little sclerotized abdominal dorsum, very short and dark pigmented siphunculi, pigmented antennae and legs, triangular and pigmented cauda, large papillae on the prothorax and AbdI, and very numerous and conspicuous marginal papillae on other abdominal segments. These characters differentiate this species from all other Argentinean and Chilean species.

The following key, partly adapted from those by Remaudière (1994); Blackman and Eastop (1994), and García

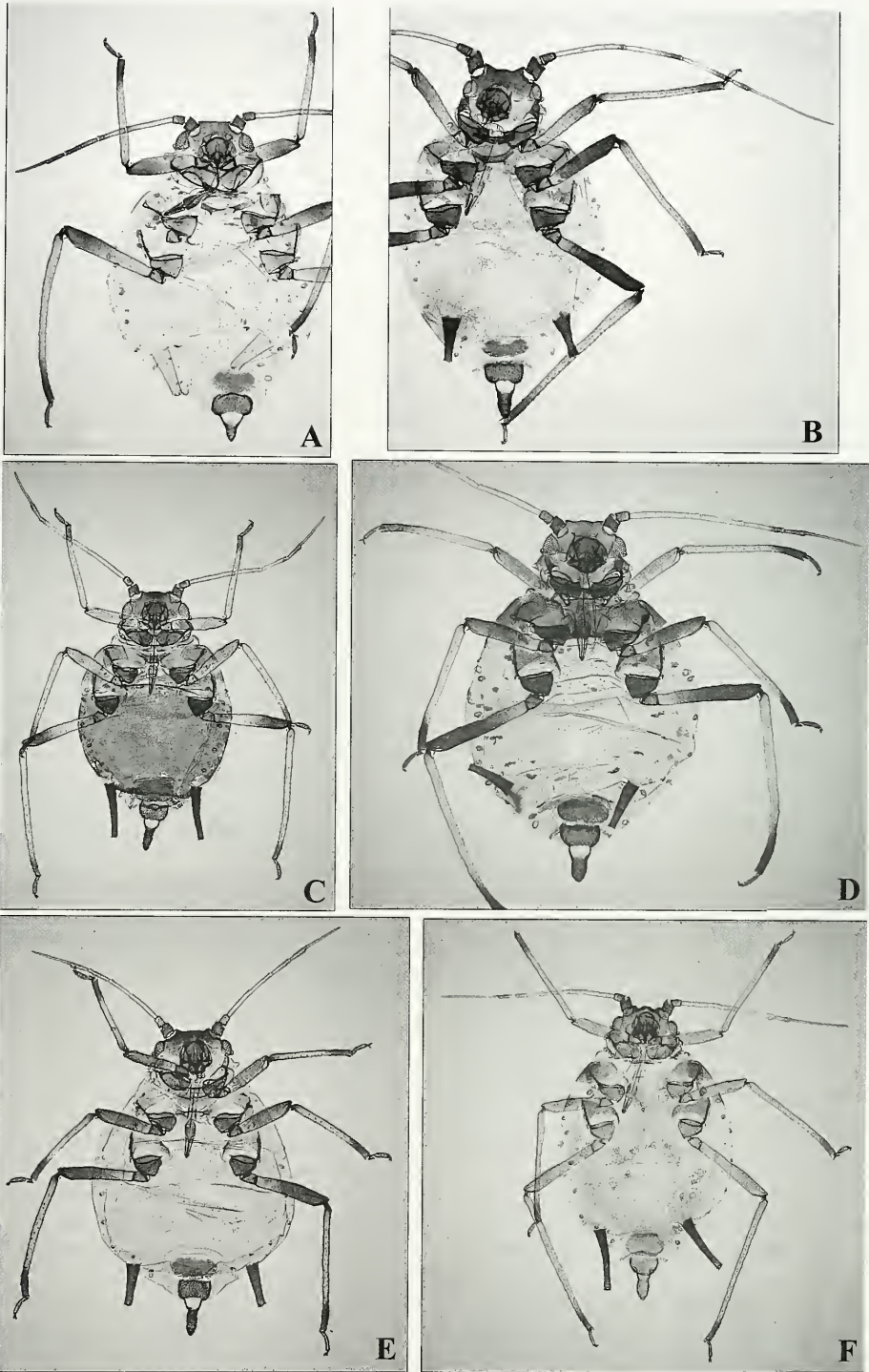


Fig. 4. Apterous viviparous females. A, *Aphis schiniifoliae*. B, *Toxoptera aurantii*. C, *A. craccivora*. D, *A. fabae*. E, *A. spiraeicola*. F, *A. gossypii*.

Prieto and Nieto Nafría (2006), provides identification of the species of the tribe Aphidini which could be found on *Schinus* spp. in South America; either already recorded (*A. schinifoliae*, *A. schinivora*, *A. gossypii* and *Toxoptera aurantii*) or recorded in other parts of the world on Anacardiaceae (*A. craccivora*, *A. fabae*, and *A. spiraeicola*).

1. Siphunculus entirely pale (Fig. 4A). [On several species of *Schinus*] *Aphis schinifoliae*
- Siphunculus brown to black, sometimes with proximal portion not as dark as distal portion 2
2. Siphunculus 1.1–2.9 times its diameter at middle and at most 0.7 times cauda; femora and tibiae light brown to dark brown, not noticeably dark and pale (Fig. 1) [On *Schinus johnstonii* and perhaps other species] *Aphis schinivora*
- Siphunculus at least 2.7 times its diameter at the middle and 0.8 times cauda, which is finger shaped; apical parts of femora and tibiae noticeably darker than proximal parts. [Polyphagous or oligphagous species] 3
3. Stridulatory mechanism present, consisting of a conspicuous pattern of ridges on ventrolateral areas of AbdV and AbdVI and a row of short peg like hairs on hind tibia (Fig. 4B) *Toxoptera aurantii*
- Stridulatory mechanism not present 4
4. AbdI–AbdV (and thoracic) dorsum with discal plate, sometimes broken or partially isolated from marginal sclerites, or partially segmented (Fig. 4C) *Aphis craccivora*
- AbdI–AbdV dorsum without discal plate, completely membranous or with isolated small plates and/or sclerites 5
5. Dorsum with variable sclerotic pigmentation, usually consisting of at least dark marginal sclerites plus bands on prothorax, mesothorax, AbdVII (with exceptions), and AbdVIII, and often also with spinal sclerites or small plates; cauda with 12–19 setae (Fig. 4D) *Aphis fabae*
- Dorsum of prothorax and mesothorax without dark bands, AbdVII and Abd VIII often with small bands or sclerites not deeply pigmented like marginal sclerites if present; cauda at most with 12 setae 6
6. Setae on femora long and fine, longest setae longer than diameter of femur at its base; cauda black, with a distinct constriction

- about one-third from base and with 6–12 setae (Fig. 4E) *Aphis spiraeicola*
- Setae on femora rather short, not exceeding diameter of femur at its base; cauda clearly paler than siphunculus, tongue-shaped, with a small constriction and bearing 4–7 setae (Fig. 4F) *Aphis gossypii*

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